THE GRADUATE COLLEGE OF THE
UNIVERSITY OF OKLAHOMA HEALTH SCIENCES CENTER

ANNOUNCES THE FINAL EXAMINATION OF

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FOR THE DEFENSE OF THE DOCTOR OF PHILOSOPHY DEGREE
GRADUATE COLLEGE
Department of Occupational and Environmental Health
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Location: Hudson College of Public Health, room 144 &
Zoom: https://ouhsc.zoom.us/j/697286218
Password: 071168

Determination of anaerobic endospore-forming bacteria cultivability losses and evaluation of novel media collection efficiencies using impingers

COMMITTEE IN CHARGE: David L. Johnson, PhD., Chair; Margaret L. Phillips, PhD; Robert A. Lynch, PhD; Bradley S. Stevenson, PhD; Chao Xu, PhD

ABSTRACT: *Clostridioides difficile* endospores (spores) are the causative agent of *C. difficile* infection, which is the third leading cause of healthcare-associate illness in the United States. Studies on aerosol concentrations and airborne dissemination of *C. difficile* spores throughout the healthcare environment have frequently resulted in negative air sampling results, even in lab-based studies where the aerosol was known to be present. This study evaluated impingement air sampling methods in the retention and collection of anaerobic endospore-forming bacteria and aimed to: (1) assess collection media and culture media differences in cultivability loss of *C. difficile* during low-volume air sampling using the SKC BioSampler™; (2) quantitatively assess the collection efficiency, relative to MCE filters, of liquid impingement media using novel and historical collection media when sampling aerosolized spores of *C. difficile* with the SKC BioSampler™; and (3) evaluate *C. sporogenes*, a commonly used surrogate for *Clostridia* species, for cultivability losses and establish whether novel impingement media will improve cultivability loss if seen. In the aim 1 dynamic retention trials, the BioSampler impingers retained cultivable *C. difficile* spores in the two novel media but not the two historically used media, and the chromogenic agar performed as well as the gold standard agar for the novel media. In aim 2, the cultivability losses were seen in the historically used media but not the novel media, and collected aerosol concentrations in novel media were on average two orders of magnitude greater than the aerosol concentrations of the historically used media, and novel media performed as well as or better than filtration cassettes for collection of viable *C. difficile* spores. In aim 3, *C. sporogenes* performed equally well with both novel and historical media, and did not exhibit the same cultivability losses and lack of retention as those seen during the aim 1 retention trials, indicating that *C. sporogenes* is not an adequate surrogate for *C. difficile* when collecting aerosol via impingement. This study demonstrated that impingement methods could be improved to reduce cultivability losses of *C. difficile*, and that the use of surrogates for air sampling using liquid impingement should be rigorously evaluated.